Claims

We claim:

1. A method for spark-processing silicon, comprising:

applying to silicon sparks of sufficiently high voltage to effect the production of spark-processed silicon, wherein applying to the silicon sparks of sufficiently high voltage to effect the production of spark-processed silicon creates a spark plasma; and

introducing into the spark plasma a volatile liquid in which particles are suspended.

2. The method according to claim 1,

wherein introducing into the spark plasma a volatile liquid in which particles are suspended during the production of the spark-processed silicon enhances the electroluminescence of the spark-processed silicon.

3. The method according to claim 1,

wherein Si particles are suspended in the volatile liquid.

4. The method according to claim 3,

wherein Si particles having a size in the range of about 0.2 μm to about 20 μm are suspended in the volatile liquid.

5. The method according to claim 1,

wherein SiO_2 particles are suspended in the volatile liquid.

6. The method according to claim 5,

wherein SiO_2 particles having a size in the range of about 0.2 μm to about 20 μm are suspended in the volatile liquid.

7. The method according to claim 1,

wherein Si_3N_4 particles are suspended in the volatile liquid.

8. The method according to claim 7, wherein Si_3N_4 particles having a size in the range of about 0.2 μm to about 20 μm are suspended in the volatile liquid.

9. The method according to claim 1,
wherein the volatile liquid comprises methanol.

10. The method according to claim 1,
wherein the volatile liquid comprises ethanol.

11. The method according to claim 1,
wherein the volatile liquid comprises acetone.

12. The method according to claim 1,
wherein introducing into the spark plasma a volatile liquid in which particles are suspended creates an aerosol of the volatile liquid in which particles are suspended.

13. The method according to claim 1,
wherein applying to the silicon sparks comprises applying a voltage between an electrode and the silicon.

14. The method according to claim 13,
wherein introducing into the spark plasma a volatile liquid in which particles are suspended comprises introducing into the spark plasma a volatile liquid in which particles are suspended via a means for introducing into the spark plasma a volatile liquid in which particles are suspended which is in electrical contact with the electrode.

15. The method according to claim 13,
wherein introducing into the spark plasma a volatile liquid in which particles are suspended comprises introducing into the spark plasma a volatile liquid in which particles

are suspended via a means for introducing into the spark plasma a volatile liquid in which particles are suspended which is electrically isolated from the electrode.

16. The method according to claim 13,

wherein a tip of the electrode is separated from the silicon by a distance between about 0.5 mm and about 10mm.

17. The method according to claim 13,

wherein a tip of the electrode is separated from the silicon by a distance between about 3mm and about 4mm.

18. The method according to claim 14,

wherein the means for introducing into the spark plasma a volatile liquid in which particles are suspended comprises a metal needle, wherein the metal needle acts as the electrode.

19. The method according to claim 18,

wherein the tip of the needle is modified such that an aerosol of the volatile liquid in which particles are suspended is introduced into the spark plasma.

20. A method for spark-processing silicon, comprising:

applying to the silicon sparks of sufficiently high voltage to effect the production of spark-processed silicon, wherein applying to the silicon sparks of sufficiently high voltage to effect the production of spark-processed silicon creates a spark plasma ; and

introducing into the spark plasma a volatile liquid in which a salt of a heavy ion is dissolved.

21. The method according to claim 20,

wherein the salt of a heavy ion is a transition metal salt.

22. The method according to claim 21,

wherein the transition metal salt is manganese chloride.

23. The method according to claim 20,

wherein the salt of a heavy ion is rare earth ion salt.

24. The method according to claim 20,

wherein the salt of a heavy ion is a lanthanide ion salt.

25. The method according to claim 24,

wherein the lanthanide ion salt is selected from the group consisting of: cerium chloride, terbium chloride, and europium chloride.

26. The method according to claim 20,

wherein introducing into the spark plasma a volatile liquid in which a salt of a heavy ion is dissolved during the production of the spark-processed silicon creates an aerosol of the volatile liquid in which a salt of a heavy ion is dissolved.

27. An electroluminense device, comprising:

a silicon substrate having a first surface and a second surface;

an ohmic contact on the first surface of the silicon substrate;

spark-processed silicon on the second surface of the silicon substrate, wherein the spark-processed silicon on the second surface of the silicon substrate is produced by:

applying to the second surface of the silicon substrate sparks of sufficiently high voltage to effect the production of spark-processed silicon, wherein applying to the second surface of the silicon substrate sparks of sufficiently high voltage to effect the production of spark-processed silicon creates a spark plasma; and

introducing into the spark plasma a volatile liquid in which particles are suspended;

a semitransparent film of an electrically conducting material on the surface of the spark-processed silicon; and

a means for applying a voltage between the ohmic contact and the semitransparent film, wherein the semitransparent film is negatively biased with respect the ohmic contact, wherein light is emitted from the spark-processed silicon and passes through the semitransparent film upon application of a sufficient voltage between the ohmic contact and the semitransparent film.

28. The device according to claim 27,

wherein the semitransparent film comprises Ag.

29. The device according to claim 27,

wherein the semitransparent film comprises a material selected from the group consisting of: Al, Au, an organic, transparent, conducting material, and an inorganic, transparent, conducting material.

30. An electroluminense device, comprising:

a silicon substrate having a first surface and a second surface;

an ohmic contact on the first surface of the silicon substrate;

spark-processed silicon on the second surface of the silicon substrate, wherein the spark-processed silicon on the second surface of the silicon substrate is produced by:

applying to the second surface of the silicon substrate sparks of sufficiently high voltage to effect the production of spark-processed silicon, wherein applying to the second surface of the silicon substrate sparks of sufficiently high voltage to effect the production of spark-processed silicon creates a spark plasma; and

introducing into the spark plasma a volatile liquid in which a salt of a heavy ion is dissolved;

a semitransparent film of an electrically conducting material on the surface of the spark-processed silicon; and

a means for applying a voltage between the ohmic contact and the semitransparent film, wherein the semitransparent film is negatively biased with respect to the ohmic contact, wherein light is emitted from the spark-processed silicon and passes through the semitransparent film upon application of a sufficient voltage between the ohmic contact and the semitransparent film.

31. The device according to claim 30,

wherein the semitransparent film comprises Ag.

32. The device according to claim 30,

wherein the semitransparent film comprises a material selected from the group consisting of: Al, Au, an organic, transparent, conducting material, and an inorganic, transparent, conducting material.